

DOCUMENT RESUME

ED 472 323

SE 067 109

AUTHOR Wojnowski, Brenda S.; Bellamy, Mary Louise; Cooke, Sharon
TITLE A Review of Literature on the Mentoring and Induction of
Beginning Teachers with an Emphasis on the Retention and
Renewal of Science Teachers.
PUB DATE 2003-00-00
NOTE 12p.; In: Science Teacher Retention: Mentoring and Renewal.
Issues in Science Education; see SE 066 056.
PUB TYPE Reports - Descriptive (141)
EDRS PRICE EDRS Price MF01 Plus Postage. PC Not Available from EDRS
DESCRIPTORS *Beginning Teachers; Elementary Secondary Education;
*Mentors; Pedagogical Content Knowledge; Professional
Development; Science Instruction; *Science Teachers

ABSTRACT

A number of studies concerning the mentoring of beginning teachers and their induction process are found in recent educational publications. A review of this literature guides professional educators as they formulate and implement the work of educating a scientifically literate populace. This literature synopsis addresses critical issues concerning teacher retention and renewal. (Contains 47 references.) (Author/YDS)

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL IN MICROFICHE
AND IN ELECTRONIC MEDIA FOR ERIC
COLLECTION SUBSCRIBERS ONLY,
HAS BEEN GRANTED BY

S. W. Holt
Inet on

TO THE EDUCATIONAL RESOURCES
2A INFORMATION CENTER (ERIC)

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

☒ This document has been reproduced as
received from the person or organization
originating it.

☐ Minor changes have been made to
improve reproduction quality.

• Points of view or opinions stated in this
document do not necessarily represent
official OERI position or policy.

A Review of Literature on the Mentoring and Induction of Beginning Teachers with an Emphasis on the Retention and Renewal of Science Teachers

Brenda S. Wojnowski, Mary Louise Bellamy, and Sharon Cooke

Brenda S. Wojnowski is the associate director of The Science House at North Carolina State University. The Science House is the educational outreach arm of the College of Physical and Mathematical Sciences at North Carolina State University. The mission of The Science House is to build partnerships between the University and K-12 schools and school systems. Dr. Wojnowski is a former award-winning teacher who has conducted numerous professional development experiences for teachers, administrators, and university faculty. She has received funding from a variety of sources, including the National Science Foundation and the U.S. Department of Education, and has given many presentations at professional meetings and conferences on topics ranging from science education, to equity issues, to partnership building. Her doctoral dissertation concerned the mentoring of beginning teachers.

Mary Louise Bellamy is the K-12 educational outreach coordinator for the National Science Foundation's Science and Technology Center for the Study of Environmentally Responsible Solvents and Processes, The Science House, North Carolina State University. She is a former teacher and former education director of the National Association of Biology Teachers. Bellamy has authored and edited numerous articles and books.

Sharon Cooke is a retired high school teacher and a graduate research assistant for the National Science Foundation's Science and Technology Center for the Study of Environmentally Responsible Solvents and Processes, The Science House, North Carolina State University.

The growing number of teachers leaving the profession before retirement is a significant cause of teacher turnover and subsequent teacher vacancies. Compounding this situation is the fact that top undergraduates ... who become teachers are more likely than their peers to leave teaching in three to five years. In addition, analysis of data ... indicates that teachers who have not participated in induction or mentoring programs during their first few years of teaching, are twice as likely as those who have participated to leave after their first three years of teaching. The shortage of [science] teachers is more severe than it is in other areas, making [science] teacher retention a national priority.

(National Science Foundation 2001, 33-34)

This work was supported in part by the STC Program and the Division of Biological Infrastructure of the National Science Foundation under Agreement No. CHE-9876674 and Award No. DBI-0115642. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.

A number of recent reports point to the lack of achievement and understanding in science among pre-college students in the United States. Two of the most notable, *What Matters Most: Teaching for America's Future* (National Commission on Teaching and America's Future 1996) and *Before It's Too Late: A Report to the Nation from the National Commission on Mathematics and Science Teaching for the 21st Century* (National Commission on Mathematics and Science Teaching 2000) reach the same conclusion: The only way to combat the problem of low student achievement is to improve the quality of science teaching in America's schools.

The report *What Matters Most* explicitly states: "Student learning in this country will improve only when we focus our efforts on improved teaching" (6). In *Before It's Too Late*, the problem is described as follows: "In an age now driven by the relentless necessity of scientific and technological advance, the preparation our students receive in ... science is, in a word, unacceptable" (10). The report goes on to call for changes in science teaching in order to address the problems of student achievement in this critical area. It concludes that the "need for high-quality teaching ... demands a vigorous, national response that unifies the efforts of all stakeholders in ... science education" (24).

Mentoring and Induction Programs as a Means of Improving Teaching

In *Local Leadership for Science Education Reform*, Anderson and Pratt (1995) describe the problem of teacher isolation as it relates to school reform and, hence, student achievement. They feel that the customary isolation among teachers found in most school cultures acts to inhibit the change process. The effects of isolation are well documented in mentoring and induction educational literature. (See, in chronological order, Lortie 1975; Grant and Zeichner 1981; Pataniczek and Isaacson 1981; Egan 1986a; Huffman and Leak 1986; Huling-Austin 1986; Zaharias and Frew 1987.)

In his landmark study described in *A Place Called School*, Goodlad (1984), like Anderson and Pratt, described the isolation in which teachers work and their lack of opportunity for collaborative efforts with their peers. He felt that America's schools must endeavor to improve the conditions under which teachers labor if the nation is to upgrade its schools.

Many current references call for effective mentoring and induction programs for beginning teachers as a way to improve teacher-teacher interaction and reduce isolation, especially among early career teachers. The report *Building a Profession: Strengthening Teacher Preparation and Induction* by the American Federation of Teachers (2000) cites the need for induction programs "for all beginning teachers" (10). Plummer and Barrow (1998) and the National Commission on Mathematics and Science Teaching for the 21st Century (2000) agree that beginning teachers are especially in need of the support that can be provided through a formal induction program. *Before It's Too Late* (National Commission on Mathematics and Science Teaching 2000) goes on to advocate "formal mentoring relationships" as part of these programs (33). Likewise, in order for positive change in teacher preparation

and professional development to occur, *What Matters Most* (National Commission on Teaching and America's Future 1996) calls for the creation of "mentoring programs for beginning teachers that provide support and evaluate teaching skills" (20).

In the current U.S. education climate, it is especially important to support teachers who are new to a school and those new to the profession because they will represent such a large percentage of the overall teaching force. "Over the next decade [1999-2009], America will need to hire some 200,000 K-12 teachers annually, a staggering hiring demand" (Fideler and Haselkorn 1999, 4). According to Darling-Hammond (1997), "the nation has never before hired as many teachers in a decade as it will between [1997] and the year 2007. The demand for teachers will continue to grow sharply as student enrollments reach their highest level ever, and teacher retirements and attrition create large numbers of vacancies" (15).

Difficulties Associated with the Early Years of Teaching

The first year of teaching is widely recognized as an extremely difficult and traumatizing experience for many beginning teachers (Grant and Zeichner 1981; Hawley 1986; Hoffman et al. 1986). Gold (1996) describes the critical nature of the first year of teaching: "Few experiences in life have such a tremendous impact on the personal and professional life of a teacher as does the first year of teaching" (548). The initial year in the profession can be a time of intense distress during which neophytes face harsh situations and potentially overwhelming problems while functioning in a state of isolation (Pataniczek and Isaacson 1981).

Too often beginning teachers are expected to enter the teaching profession with a complete repertoire of teaching skills (Fagan and Walter 1982). "Fully responsible for the instruction of his students from his first working day, the beginning teacher performs the same tasks as the twenty-five year veteran. Tasks are not added sequentially to allow for gradual increase in skill and knowledge.... If it is true that too much anxiety retards learning, some beginning teachers will have difficulty making accurate perceptions and thoughtful decisions" (Lortie 1975, 72) during the critical induction period when they will be shaping the attitudes, skills, and strategies that will govern their entire teaching careers (Egan 1986b; Grant and Zeichner 1981).

What Matters Most (National Commission on Teaching and America's Future 1996) defines the problems beginning teachers face in this way: "Beginning teachers...are typically given the most difficult assignments and left to flounder on their own, without the kind of help provided by internships in other professions. Isolated behind classroom doors with little feedback or help, as many as 30% leave in the first few years, while others learn merely to cope rather than to teach well" (14). Berliner (1988) describes how teachers become better at their profession the longer they teach. He details five stages of teacher career development: novice, advanced beginner, competent teacher, proficient teacher, and expert. According to Berliner, a teacher is not likely to reach the level of competence until the third year of teaching. If a teacher does not stay with the profession long enough to achieve this

level of competence, then students are constantly being taught by individuals in the early stages of career development. The logical outcome is that, over time, the achievement and understanding of students taught by these early career teachers will suffer.

Plummer and Barrow (1998) report an escalating continuum of attrition from 1965 through 1998 associated with the difficult circumstances of the early years of teaching. Middle and high school teachers need special support during their early years of teaching (Fideler and Haselkorn 1999; Gold 1996). According to Fideler and Haselkorn (1999), "Teachers new to working with high school and inner-city students in schools with large numbers of minority and lower income students are especially prone to attrition. This effectively ensures that students in the nation's most challenging classrooms will continue to get its least qualified teachers" (4).

Veenman (1984) compiled a comprehensive review of literature detailing the needs of beginning teachers. These needs include generic pedagogical knowledge and skills, such as classroom discipline and management. Gold (1996) goes on to say that although beginning teachers need help in developing these essential early career survival skills, they also need help in developing pedagogical content knowledge (PCK). The term *pedagogical content knowledge* was originally defined by L. Shulman (1986) as "the most useful forms of representation (of ideas in a discipline), the most powerful analogies, illustrations, examples, explanations, and demonstrations—in a word, the ways of representing and formulating the subject that makes it comprehensible to others" (9). (The definition of PCK has since been broadened to include other aspects of teacher knowledge; see Cochran, DeRuiter, and King 1993.)

Gold (1996) explicitly concludes, "To limit the majority of the instructional support to these [early survival] needs fails to provide the beginning teacher with an understanding of the more complex nature of the structure of knowledge and the process of acquiring pedagogical content knowledge that is needed" (562).

Types of Educational Mentoring

According to Loucks-Horsley et al. (1998), "reflection by an individual on his or her own practice can be enhanced by another's observations and perceptions.... [B]y simply holding up a mirror, a coach or mentor can bring to consciousness some useful information for teachers with regard to their practice" (127).

Traditional Mentoring

Mentoring is certainly not a new idea. In Homer's *Odyssey*, Odysseus assigned the care of his young son, Telemachus, to his friend, Mentor. The recent revival of interest in mentoring can be traced to the work of Erickson (1950) and Levinson et al. (1978) in their classic studies, *Childhood and Society* and *The Seasons of a Man's Life*, respectively.

Mentoring is currently making significant inroads in many areas of education in large part because of the need to reduce teacher isolation and retain new teachers. Mentoring relationships often develop informally. However, because "we need men-

tors throughout our lifelong journey" (Darling 1989, 12), institutions sometimes initiate formal planned mentoring programs to fill the void often left by informal unplanned mentoring. According to Ganer (1996), "Mentor relationships can emerge naturally, but teacher isolation makes this unlikely for many new teachers. Mentor programs must assure that mentoring is not left to chance" (9).

According to Guskey (2000) and Loucks-Horsley et al. (1998), a mentoring relationship typically involves matching an experienced teacher with a less experienced one. Loucks-Horsley et al. (1998) specifically refer to the mentoring relationship of beginning science teachers in this way: "Mentors in science ... programs are typically teachers with more content knowledge or experience in using a particular program or practice who work with those less experienced" (127).

Collegial Mentoring

Collegial mentoring, often referred to as peer coaching, consists of pairs of teachers who work together toward a common goal: improving their educational practices. Collegial mentoring differs from other forms of mentoring in that it exists between equals (Anderson and Pratt 1995). Collegial mentoring can be invaluable when an experienced teacher changes jobs or grade levels (Egan 1986a; Recruiting New Teachers, Inc. 2000; Shulman, J. 1988).

Each member of the coaching pair has the benefit of a colleague to provide reflective feedback on his or her progress and to offer positive support for his or her efforts (George 1989; Joyce and Showers 1982; Krajewski and McCumsey 1984). At the same time, "opportunities provided for professional teacher growth by means of collegial support alleviate classroom isolation, which can be detrimental to teacher satisfaction and development" (Taylor 1987, 27).

Professional Development Mentoring

Training for academic mentoring usually takes the form of professional development. To be effective, professional development activities must be targeted to the needs and concerns of the participants, as well as to the innovation under discussion—in this case, mentoring (Hall and Loucks 1978). According to Guskey (2000), "the mentoring model of professional development typically involves pairing an experienced and highly successful educator with a less experienced colleague" (28). The National Research Council's *National Science Education Standards* (1996) discusses the need for such interactions among science teachers in particular: "Professional development activities must: Support the sharing of teacher expertise by preparing and using mentors ... to provide professional development opportunities" (68).

Characteristics of Good Mentoring/Induction Programs

How should mentoring and induction programs be structured to provide the most valuable support for new teachers? Based on research and the expertise of those

working in this field, characteristics of effective mentoring and induction programs have been identified.

- ◆ An induction program should span more than one year and address the changing needs of teachers as they grow professionally (Fideler and Haselkorn 1999; Recruiting New Teachers, Inc. 2000).
- ◆ "Beginning teachers should be placed in situations that are appropriate to their novice status so they will have the opportunity to develop fully as teaching professionals," according to the California Commission on Teacher Credentialing (1997, 10).
 - ◆ Beginning teachers should be given reasonable teaching schedules and should not be assigned the hardest students to teach (National Commission on Mathematics and Science Teaching 2000).
 - ◆ Beginning teachers should be given fewer extracurricular duties than are assigned to experienced teachers (National Commission on Mathematics and Science Teaching 2000).
- ◆ Effective mentoring should be an integral part of any induction program (Fideler and Haselkorn 1999). The mentoring program should include the following elements:
 - ◆ Mentors should be identified carefully (American Federation of Teachers 2000; Recruiting New Teachers, Inc. 2000) and should be able to interact effectively with other teachers (Recruiting New Teachers, Inc. 2000). Guskey (2000) indicates that mentors need to be experienced and excellent teachers. "The best mentors have great credibility among their colleagues and are recognized for their ability to initiate curriculum and school change. They are also highly competent in their subject area and respected by students" (28).
 - ◆ Mentors should receive appropriate and sufficient training in order to be effective in supporting new teachers (American Federation of Teachers 2000; Fideler and Haselkorn 1999; Recruiting New Teachers, Inc. 2000; Loucks-Horsley et al. 1998). According to the California Commission on Teacher Credentialing (1997), "excellent teachers are not necessarily prepared to help others develop professionally" (15). Consequently, Ganser (1996) describes knowledge and skills that mentors need to learn during training in order to be effective. The areas of *knowledge* include (1) concerns of beginning teachers; (2) stages of teacher career development; (3) how adults learn; (4) how beginning teachers have been prepared in preservice programs; and (5) innovative curriculum and teaching strategies. The *skills* mentors need to learn, according to Ganser, include (1) conferencing skills, (2) observation skills, and (3) problem-solving skills. (See also *A Guide to Developing Teacher Induction Programs* [Recruiting New Teachers, Inc. 2000, 25] for knowledge and skills mentors need.)
 - ◆ The mentoring process should begin before school starts, with mentors and mentees meeting before the beginning teachers are actually responsible for their own classrooms (Ganser 1996; Recruiting New Teachers, Inc. 2000).

- Loucks-Horsley et al. (1998) maintain that "For coaching and mentoring to succeed as strategies for professional development, several key elements must be in place ... A Focus for Learning or Improvement ... Mechanisms for Sharing and Feedback... [and] ... Opportunities for Interaction" (128). Mentors (American Federation of Teachers 2000; Fideler and Haselkorn 1999; Recruiting New Teachers, Inc. 2000) and early career teachers (California Commission on Teacher Credentialing 1997) should be given adequate time to meet with each other and observe each other teaching. According to the California Commission on Teacher Credentialing (1997), "support providers/assessors and beginning teachers [should be] given dedicated time in the form of released time, reduced teaching load, and/or joint planning periods to work together" (20).
- Mentors should be compensated for their work with beginning teachers (American Federation of Teachers 2000; Recruiting New Teachers, Inc. 2000).
- ◆ Teachers should have access to and support in computer technologies, including communication resources such as e-mail (Fideler and Haselkorn 1999; Recruiting New Teachers, Inc. 2000). They should be given needed instruction in the use of these resources in their classrooms (National Commission on Mathematics and Science Teaching 2000).

The importance of these elements of mentoring and induction is summarized in *Building a Profession: Strengthening Teacher Preparation and Induction* (American Federation of Teachers 2000): "No package of teacher education reforms can be expected to ensure a continuing supply of qualified teachers unless it is coupled with high-caliber induction programs, better salaries and improved working conditions" (15).

Barriers to Successful Mentoring/Induction Programs

Although mentoring and induction programs have become widespread in the United States in recent years, significant barriers to their effectiveness exist and often prevent such programs from being as successful as they could be. While it is beyond the scope of this article to provide an exhaustive review of the literature, some of these barriers include:

- ◆ Lack of mentors, time, and professional development (Phillips-Jones 1989; Woodruff 1990);
- ◆ Inadequate and unpredictable funding (Fideler and Haselkorn 1999; Recruiting New Teachers, Inc. 2000); and
- ◆ The traditional culture of most schools. "Norms of isolation and privacy work against many teachers' willingness to open their classrooms and their teaching to observation and scrutiny" (Loucks-Horsley et al. 1998, 131).

Positive Outcomes of Mentoring/Induction Programs

Research evidence shows three important positive outcomes associated with mentoring and/or induction programs:

- ◆ Improvement of the teaching practices of new teachers
- ◆ Benefits to the mentor as well as to the beginning teacher
- ◆ Lowering of attrition rates for new teachers

Research data provide evidence that mentoring experiences can help early career teachers improve their teaching practices. Citing Giebelhaus and Bowman (2000), Holloway (2001) states: "Data analysis indicated that prospective teachers who were assigned mentors trained in using [a] discussion framework demonstrated more complete and effective planning, more effective classroom instruction, and a higher level of reflection on practice than did new teachers whose mentors had received only an orientation program. The researchers concluded that formal induction program models ... provide a framework for discussion, reflection, and goal setting and lead to more effective teaching by novices" (8).

Gold's 1996 article on beginning teacher support programs reported that the attrition rate of beginning teachers who were mentored was appreciably lower than the rate for their nonmentored peers. Loucks-Horsley (1999) stated, "[R]esearch indicates that effective mentoring programs can lower the attrition rate of new teachers, significantly decreasing the length and trauma of their induction period into the profession" (26).

Guskey (2000) maintains that the mentoring experience benefits both the mentor and the protégé. Research evidence from studies reported by Scott (1999), Hegstad (1999), and Holloway (2001) supports Guskey's assertion. "A focused, systematic mentoring program has a positive influence on the performance of new teachers—and is advantageous to mentors as well. Above all, this support for new teachers benefits their students" (Holloway 2001, 9).

How Mentoring/Induction Experiences Can Meet the Needs of Science Teachers

The characteristics of effective mentoring and induction programs described earlier are important to all early career teachers, including science teachers, as they learn to teach in reform-based ways. As discussed earlier, Gold (1996) states that beginning teachers need help not only with survival skills that include classroom management, but also with increasing their pedagogical content knowledge (PCK). Mentors are an important source of this knowledge (Loucks-Horsley et al. 1998).

Characteristics and development of PCK are described by Cochran (1997): "[P]edagogical content knowledge is highly specific to the concepts being taught, is much more than just subject matter knowledge alone, and develops over time as a result of teaching experience" (2). Loucks-Horsley et al. (1998) describe the importance of PCK in the teaching mentoring relationship in this way: "The critical and specialized knowledge that experienced teachers have—pedagogical content knowledge—is [the very knowledge] that helps teachers understand what their students need, how they come to understand certain concepts and principles of the content,

and what they need to increase that understanding. Sharing this kind of expertise is at the core of coaching and mentoring" (128).

The importance of the PCK of the mentor strongly suggests that the mentor and the early career teacher should teach the same content area. Loucks-Horsley et al. (1998) support this suggestion: "[T]he more a coach or mentor understands about the content being taught and knows from experience how students learn it (and how to teach it), the better. Although good coaches and mentors can help teachers become more reflective in their practice, and better inquirers into problems and dilemmas of teaching, they can be of much greater assistance if they know the specific content being taught by the teachers with whom they are working" (129). Beginning science teachers, therefore, benefit the most by being paired with excellent mentors who are also science teachers.

References

- American Federation of Teachers. 2000. *Building a profession: Strengthening teacher preparation and induction*. Report of the K-16 Teacher Education Task Force. Washington, DC: American Federation of Teachers.
- Anderson, R. D., and H. Pratt. 1995. *Local leadership for science education reform*. Dubuque, IA: Kendall/Hunt.
- Berliner, D. C. 1988. *Implications of studies of expertise in pedagogy for teacher education and evaluation*. Paper presented at the 1988 Educational Testing Service Invitational Conference on New Directions for Teacher Assessment, New York City.
- California Commission on Teacher Credentialing. 1997. *Standards of quality and effectiveness for beginning teacher support and assessment programs: A description of professional induction for beginning teachers*. Sacramento, CA: State of California.
- Cochran, K. F. 1997. *Pedagogical content knowledge: Teachers' integration of subject matter, pedagogy, students, and learning environments*. Research Matters—to the Science Teacher No. 9702. National Association of Research in Science Teaching (NARST) publication.
- Cochran, K. F., J. A. DeRuiter, and R. A. King. 1993. Pedagogical content knowing: An integrative model for teacher preparation. *Journal of Teacher Education* 44: 263-72.
- Darling, L. W. 1989. The mentoring discovery process: Helping people manage their mentoring. *Mentoring International* 3(2): 12-16.
- Darling-Hammond, L. 1997. *Doing what matters most: Investing in quality teaching*. Kutztown, PA: National Commission on Teaching and America's Future.
- Egan, J. B. 1986a. Characteristics of classroom teachers' mentor-protégé relationships. In *Proceedings of the First International Conference on Mentoring* (Vol. 1), eds. M. M. Gray and W. A. Gray, 55-62. Vancouver, B.C., Canada: International Centre for Mentoring.
- . 1986b. *Induction the natural way: Informal mentoring*. Paper presented at the Eleventh Annual National Council of States on Inservice Education, Nashville, Tennessee, November 21-25, 1986. (ERIC Document Reproduction Service No. ED 275656.)
- Erickson, E. 1950. *Childhood and society*. New York: Norton.
- Fagan, M. M., and G. Walter. 1982. Mentoring among teachers. *Journal of Educational Research* 76(2): 113-18.
- Fideler, E., and D. Haselkorn. 1999. *Learning the ropes: Urban teacher induction programs and practices in the United States*. Retrieved January 16, 2002, from Belmont, MA: Recruiting New Teachers, Inc. website: <http://www.mt.org/publications/ropes.html>

- Ganser, T. 1996. Preparing mentors of beginning teachers: An overview for staff developers [Electronic version]. *Journal of Staff Development* 17: 8-11.
- George, M. 1989. Maximizing the experience of mentor teachers: An evolving process. *Mentoring International* 3(2): 21-24.
- Gold, Y. 1996. Beginning teacher support: Attrition, mentoring, and induction. In *Handbook of research on teacher education* (2nd ed.), eds. J. Sikula, T. J. Buttery and E. Guyton, 548-94. New York: Macmillan.
- Goodlad, J. I. 1984. *A place called school*. New York: McGraw-Hill.
- Grant, C. A., and K. M. Zeichner. 1981. Inservice support for first year teachers: The state of the scene. *Journal of Research and Development in Education* 14(2): 99-110.
- Guskey, T. R. 2000. *Evaluating professional development*. Thousand Oaks, CA: Corwin Press.
- Hall, G., and S. Loucks. 1978. Teacher concerns as a basis for facilitating and personalizing staff development. *Teachers College Record* 80(1): 36-53.
- Hawley, W. D. 1986. Toward a comprehensive strategy for addressing the teacher shortage. *Phi Delta Kappan* 67(10): 712-18.
- Hegstad, C. 1999. Formal mentoring as a strategy for human resource development: A review of research. *Human Resource Development Quarterly* 10(4): 383-90.
- Hoffman, J. V., S. A. Edwards, S. O'Neal, S. Barnes, and M. Paulessen. 1986. A study of state-mandated beginning teacher programs. *Journal of Teacher Education* 37(1): 16-21.
- Holloway, J. H. 2001. Research Link/The benefits of mentoring [Electronic version]. *Educational Leadership* 58(8).
- Huffman, G., and Leak, S. 1986. Beginning teachers' perceptions of mentors. *Journal of Teacher Education* 37(1): 22-25.
- Huling-Austin, L. 1986. What can and cannot reasonably be expected from teacher induction programs. *Journal of Teacher Education* 37(1): 2-5.
- Joyce, B., and B. Showers. 1982. The coaching of teaching. *Educational Leadership* 40(1): 4-9.
- Krajewski, R. J., and N. L. McCumsey. 1984. How to help beginning teachers. *Streamlined Seminar* 2(6): 1-6.
- Levinson, D. J., C. N. Darrow, E. B. Klein, M. A. Levinson, and B. McGee. 1978. *The seasons of a man's life*. New York: Ballentine Books.
- Lortie, D. C. 1975. *School teacher*. Chicago: University of Chicago Press.
- Loucks-Horsley, S. 1999. *Ideas that work: Science professional development* (GPO Publication No. ENC 99-004). Washington, DC: U.S. Department of Education.
- Loucks-Horsley, S., P. W. Hewson, N. Love, and K. E. Stiles. 1998. *Designing professional development for teachers of science and mathematics*. Thousand Oaks, CA: Corwin Press.
- National Commission on Mathematics and Science Teaching for the 21st Century. 2000. *Before it's too late: A report to the nation from the National Commission on Mathematics and Science Teaching for the 21st Century*. Washington, DC: U.S. Department of Education.
- National Commission on Teaching and America's Future. 1996. *What matters most: Teaching for America's future*. New York: Teachers College, Columbia University.
- National Research Council. 1996. *National science education standards*. Washington, DC: National Academy Press.
- National Science Foundation. 2001. *Elementary, secondary, and informal education program solicitation and guidelines* (GPO Publication No. NSF 01-060). Washington, DC: U.S. Government Printing Office.

- Pataniczek, D., and N. S. Isaacson. 1981. The relationship of socialization and the concerns of beginning secondary teachers. *Journal of Teacher Education* 32(3): 14-17.
- Phillips-Jones, L. 1989. Common problems in planned mentoring programs. *Mentoring International* 1: 36-40.
- Plummer, D. M., and L. H. Barrow. 1998. Ways to support beginning science teachers. *Journal of Science Teacher Education* 9(4): 293-301.
- Recruiting New Teachers, Inc. 2000. *A guide to developing teacher induction programs*. Belmont, MA: Recruiting New Teachers, Inc.
- Scott, N. H. 1999. *Supporting new teachers: A report on the 1998-99 beginning teacher induction program in New Brunswick*. New Brunswick: University of New Brunswick. (ERIC Document Reproduction Service No. ED437347)
- Shulman, J. 1988. Look to a colleague. *Instructor and teacher* 97(5): 32-34.
- Shulman, L. S. 1986. Those who understand: Knowledge growth in teaching. *Educational Researcher* 15(2): 4-14.
- Taylor, S. E. 1987. The California mentor teacher program: A preliminary evaluation of one district's program. *International Journal of Mentoring* 1(1): 27-30.
- Veenman, S. 1984. Perceived problems of beginning teachers. *Review of Educational Research* 54(2): 143-78.
- Woodruff, B. S. 1990. *The mentoring of beginning teachers: A program review*. Doctoral diss., University of North Carolina at Greensboro.
- Zaharias, J. A., and T. W. Frew. 1987. Teacher induction: An analysis of one successful program. *Action in Teacher Education* 9(1): 49-55.



U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)



NOTICE

Reproduction Basis

- ☒ This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.
- ☐ This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").